System Set-up and Maintenance

Teacher Instruction Checklist:

Please add these items to your calendar, where appropriate.

Before	tank set-up and seed planting:
	Make one laminated copy of the Data Log for each growth chamber. Use a dry erase marker to collect data and then enter it online. Put the log somewhere prominent, where it will be easy to fill out on a regular basis.
	Find good location for growth chambers—they will be heavy once they are filled with water. For wild celery, set aside 24 cups of sand for seed dispersal later. Sand should be as dry as possible. Set it aside to dry out for several days if necessary.
	Plant wild celery seeds by March 1st.
After ta	ank set-up and seed planting:
	Send grant application to Chesapeake Bay Trust for transportation costs for planting events.
	Check water level and height of lights above water every week.
	If seeds have not germinated 2 full weeks after planting, call Mark Lewandowski at (410) 260-8634. Look Closely!
	Enter data on-line at the DNR website at
	http://mddnr.chesapeakebay.net/bgic/loginindex.cfm. If you do not have access to the
	Internet, fax data to MD-DNR each week, 2 pages per week at (410) 260-8859.
	Make sure to fill growth chambers with water before spring break.
At end	of project:
	Prepare grasses for transport to planting event. Follow instructions in this section





Materials:

Total List for 2 growth chambers

(Note: All materials will be provided by Maryland DNR/CBF unless otherwise noted.)

- 2 growth chambers
- 2 sponge filters
- 2 power heads
- 4 incandescent light bulbs (75 watt)
- 4 swing arm desk lamp
- 2 power strips with surge protectors
- 2 ground fault interrupters (GFI)
- 2 thermometers
- 2 submersible aquarium heaters (Second Nature Acura 1000- 150 watt)
- 1 pH test kit
- 1 nitrate test kit
- 6-8 planting trays (depending on plant species)
- 1 foam sheet
- 1 set of plants (wild celery seed package* or redhead grass, water stargrass, or sago pondweed propagations)
- 1 quart size freezer Ziploc bag**
- 1 bag of topsoil (lower organic content than potting soil)
- 1 bag of all-purpose sand
- 1 **ruler or yardstick for height measurement
- 1 **cup measure
- *1* **5 gallon bucket (for mixing sediment and adding water)
- 1 **about 100 feet of string (depending on the height of your ceilings) optional

* **NOTE:** It is **extremely** important to keep wild celery seeds refrigerated (not frozen) until planting

**Not provided





Setting Up Your Growth Chambers:

Note: Read all instructions before beginning

Part 1: Separate seeds (wild celery only).

At least one day before you want to plant the wild celery seeds, break each pod into several pieces. Squeeze out the seeds and gelatinous substance that encases them into a jar of cold water. The gelatin will break down in about 24 hours. Place this jar in the refrigerator until you are ready to plant the seeds.

Part 2: Assemble growth chambers.

It will take one hour to completely set up one chamber. You can break the class into two groups and do both chambers at the same time. Depending on your experiment, you will need to adjust your tank assembly. Please read the specific directions in the Experiment Section of the manual. Materials:

- 2 growth chambers
- 4 desk lamps
- 4 incandescent light bulbs
- 2 power heads
- 2 sponge filters
- 2 power strips
- 2 ground fault interrupters (GFCI)
- 2 submersible aquarium heaters (Second Nature Acura 1000-150 watt)

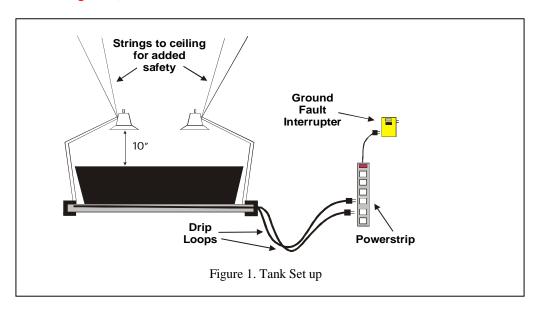
Procedure:

- 1. Once you have all the parts for your bay grass growth chamber, you will need to assemble them in your classroom. If split into two groups, a class of 15 students or more should be able to prepare the growth chamber in one hour. The growth chambers will be very heavy (approximately 100 lbs.) and difficult to move once filled, so choose your location carefully. If possible, do not place by a window.
- 2. Place chambers on table. Make sure the table has strong legs, and is near an empty wall outlet. Label the outside of each chamber clearly with an "A" or a "B".





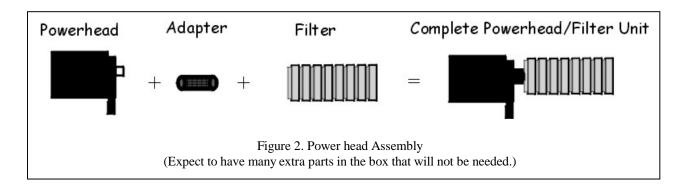
- 3. Assemble the lights and clamp them to the table so they can sit about 10 inches above the top of the chamber. Plug the lights into the power strip. Make sure a drip loop* is set up to prevent water from accidentally dripping into the power strip socket (see Figure 1).
- *It is up to the individual teacher to determine safety precautions to be taken with the lights. If accidentally submerged into the water, the light bulbs will burst and an electric shock of standard household current (120 volts) could result. Anything plugged into an outlet or power strip should have a drip loop to prevent water from accidentally dripping into the socket (see Figure 1).



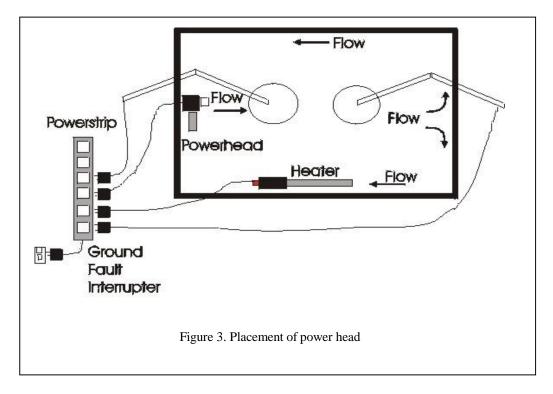




4. Prepare the power head by attaching the cylindrical plug of the power head to the water intake of the power head. Then attach the sponge filter by stretching it over the adapter (see Figure 2). The sponge filter will prevent particles from clogging up the power head. In addition, it provides a medium for beneficial bacteria to grow. The bacteria will convert other forms of nitrogen to nitrate, which will help the plants to grow. DO NOT plug in the powerhead at this point.



5. Place the power head in the short end of the tank, directing the flow down the center of the tank (see Figure 3).







Part 3: Fill Growth Chambers.

Materials:

- 2 bay grass growth chambers (from Step 2)
- 2 thermometers
- 2 submersible aquarium heaters water quality test kits

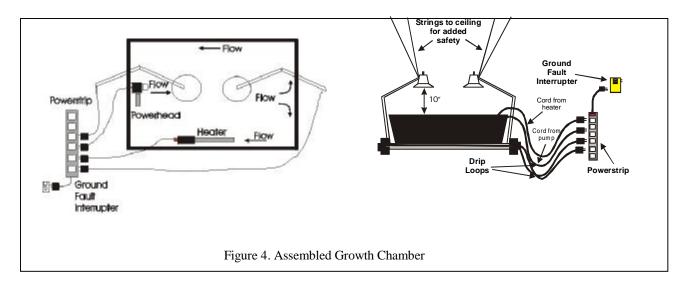
Procedure:

- 1. Fill each growth chamber with tap water to 10 cm (4 inches) deep.
- 2. Set the unplugged heater to the designated temperature:
 - Wild celery: both chambers at 75°F
 - Redhead grass/sago pondweed/water stargrass: chamber A: 75°F; chamber B: 84°F or 92°F
- 3. Lay the heater(s) in the bottom of the growth chamber. Plug heater(s) into the power strip. Set up drip loops on all cords so that water cannot run into the outlet (see Figure 4).
- 4. Plug the power strip into the GFCI and then into the outlet as in the diagram below.
- 5. Plug in the filter (and leave it on). It should immediately begin circulating water in your growth chambers. Remember to set up the drip loops!
- 6. Put the thermometer into the water. It can be attached to the side of each growth chamber with the suction cup, or it can float free.





7. The assembled growth chambers will look like this:







Preparing Wild Celery Planting Trays

(Note: Read all instructions before beginning.)

It will take one hour to prepare all of the planting trays.

Materials:

- 1- container of bay grass seeds*
- 1- bag of sand
- 1- bag of topsoil
- 1- foam sheet
- 8- planting trays
- 1- quart-sized freezer Ziploc bag (Not provided)
- 1 5-gallon bucket (Not provided)
- 1 Ruler or yardstick (Not provided)
- 1 Cup measure (Not provided)
- * It is extremely important to keep the wild celery seeds refrigerated (not frozen) until planting.

Cross section view

of planting tray

Procedure:

- 1. Set aside 24 cups of sand for use later when distributing seeds.
- 2. Thoroughly mix bag of topsoil and the remaining sand to a homogeneous mixture.
- 3. Use a permanent marker to label the lip of each of the 8 planting trays so that you can tell them apart (example: A1, A2, A3, A4, B1, B2, B3, B4).
- 4. Fill the 8 planting trays with the sediment mixture until all are equally full. Pack the sediment in each tray firmly with your fingertips.
- 5. Drain the seeds using filter paper or pour off the water using a spoon. Divide the seeds into 8 equal parts. The easiest way is to divide the pile in half, then each of those piles in half, etc.
- 6. In a quart-sized freezer Ziploc bag, add <u>1</u> of these 8 portions of seeds to 1 cup of the sand that was set aside. The sand should be as dry as possible before you add the seeds.
- 7. Shake this mixture in the quart size freezer Ziploc bag for 2 minutes.
- 8. Sprinkle this sand/seed mixture evenly over the sediment mixture that is in the planting tray.





2 cups of sand

and seeds

About 1"

Topsoil/sand mix

- 9. Sprinkle an additional 2 cups of sand from the sand set aside previously over the sand/seed mixture. This should be a very thin layer (about 1/8 of an inch). If this layer is too thick, your seeds will not germinate.
- 10. Lay the foam sheet on top of the sediment surface. Remember, once the foam is in the water, it will float, so hold it in place tightly.
- 11. Two people should <u>gently</u> lower the trays into the first growth chamber. Tip one end of the tray when lowering, <u>slowly</u>. Hold the foam in place on top of the sediment surface until all bubbling has stopped. This may take quite a while (up to one minute). This will minimize disturbance of the sediment and movement of seeds.
- 12. Remove the foam sheet carefully by lifting one end slowly. Repeat steps 6 through 12 until each growth chamber has 4 trays in it.
- 13. Fill growth chambers with more water until water depth is 17 cm (7 inches). Check this level weekly and add water when necessary. Be careful not to disturb the sediment. Turn on the lights if not on already.
- 14. You are now ready to monitor your bay grass. See the next page for details. Remember: Week 1 = the first week that germination* is noticed.

*Wild celery seeds will typically take about 7 -10 days to germinate.





Preparing Redhead Grass/Sago Pondweed/Water Stargrass Planting Trays

(Note: Read all instructions before beginning.)

It will take one hour to prepare all of the planting trays.

Materials:

- 1 Container of adult redhead grass/sago pondweed/water stargrass
- 1 Bag of sand
- 1 Bag of topsoil
- 6 Planting trays
- 1 Foam sheet
- 1 5 gallon bucket (Not provided)
- 1 Cup measure (Not provided)

Procedure:

- 1. Set aside 12 cups of sand that will be used to cover the topsoil/sand mixture.
- 2. Thoroughly mix remaining sand and topsoil in a container (bucket, black tub, etc.).
- 3. Use a permanent marker to label the lip of each of the six planting trays or punch holes in the lip with a hole puncher so that you can tell them apart. Example: A1, A2, A3, B1, B2, B3.
- 4. Fill the 6 planting trays with the topsoil/sand mixture until all 6 are equally full to within about ½ inch from the top. Pack the sediment in each tray firmly with your fingertips.
- 5. Sprinkle an additional 2 cups of sand that was set aside over the topsoil/sand mixture in each tray. This layer should be very thin. Spread sand evenly so the topsoil/sand mixture is no longer visible.
- 6. Lay the foam sheet on top of the sand/topsoil mixture surface. Remember, once the foam is in the water, it will float, so hold it in place tightly.
- 7. Two people should gently lower the trays into a growth chamber. Tip one end of the tray when lowering, slowly. Hold the foam in place on top of the sediment surface until all bubbling has stopped. This may take quite a while (up to one minute). This will minimize disturbance of the sediment and movement of plants.
- 8. Remove the foam sheet carefully by lifting one end slowly. Repeat steps 6 through 8 until each growth chamber has 3 trays in it.





- 9. Turn on lights, powerheads and make sure the heaters are set at the proper temperatures.
- 10. The parent tray will be placed in Chamber B. Fold all plants into the center of the tray, and gently cover them with the foam sheet. Lower the parent tray into the chamber as described in step 7.



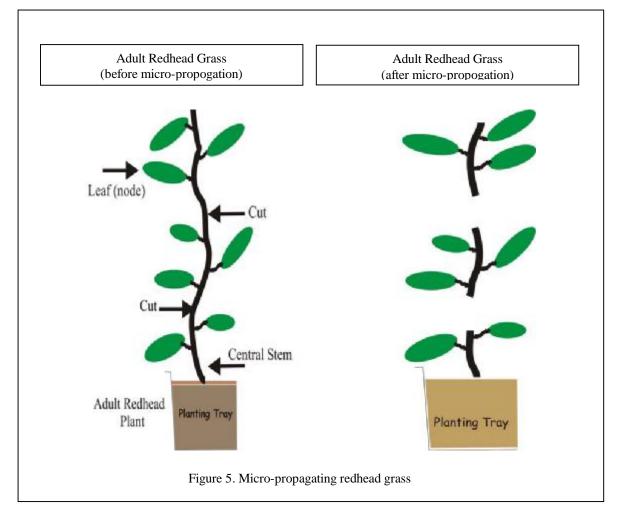


Micro-propagating redhead grass/sago pondweed/water stargrass

(Read all instructions before beginning. You will need an additional container of water to place the cuttings in during micro-propagation.)

It will take one hour to micro-propagate the plants from the parent tray.

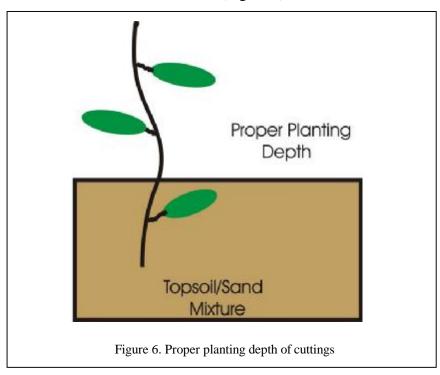
- 1. When most of the plants in the parent tray have 8 leaves, it will be micro-propagation time. It will take several weeks for the plants to be large enough to micro-propagate. Lift each adult plant from the parent tray one at a time (without pulling the plants out of the sediment), holding them upright from the top of the central stem, and cut into segments of three leaves. Make sure to make the cut from the bottom and just above the leaf (node). Leave two leaves (nodes) on the rooted parent plant (Figure 5).
- 2. Put all of the cuttings into a container of water. The cuttings must remain wet at all times.







- 3. Divide the cuttings into two groups, one for each growth chamber. The number of cuttings will vary with each micro-propagation.
- 4. Plant all of the cuttings for growth chamber A into tray 1. Using the tip of your finger, bury each cutting so that one leaf is in the sediment and two leaves are above the sediment. Make sure they are evenly spaced from the sides of the tray and the other plants. Smooth the sand flat around the base of the stem (Figure 6).

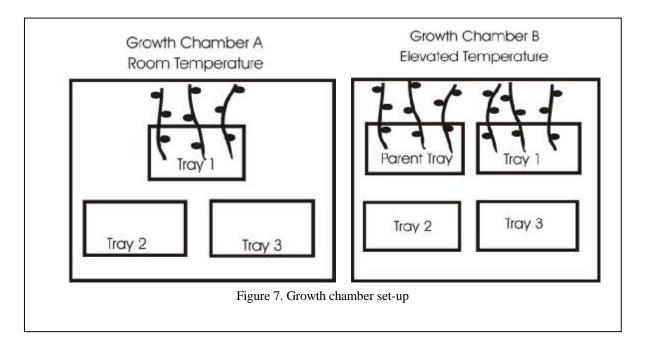


5. Repeat until all of the cuttings for chamber A have been planted. Repeat the same procedure for chamber B.





The tray with the original adult plants will be put into growth chamber B (the elevated temperature growth chamber). There will only be three trays in growth chamber A. Your set-up should look like this after the first micro-propagation:



Check the water level weekly and add water when necessary. Be careful not to disturb the sediment. Trays two and three in both growth chambers will remain empty for several weeks. When a majority of the plants in tray one have eight leaves for both growth chambers, it will be time to do your second micro-propagation.

You will cut the plants in tray one of BOTH growth chambers into segments with at least three leaves (as explained in step 1). At the same time, micro-propagate the plants in the parent tray. Put all cuttings from both trays and the parent tray into the same container of water. You will have at least twice the amount of plants after micro-propagation.

Divide those cuttings into two groups, mixing the cuttings from each growth chamber. Following the directions above, plant the cuttings into tray two in each growth chamber. Tray three will remain empty until the 4 tallest plants in tray 2 of each growth chamber have grown eight leaves. When this occurs, the above process will be repeated again. Make sure you micro-propagate the parent tray at this time. After tray three has been planted, no more micro-propagation will be done.





Monitoring Your Bay Grass

Materials:

2 - thermometers

1 - ruler

Water chemistry test kits

"Bay Grasses in Classes: Data Log"

Procedure:

You will need to consistently monitor the growth of the bay grasses and the water quality in the growth chamber. A pair of students can easily do the daily monitoring during the first five minutes of each class period, and the weekly monitoring should take no longer than 20 minutes. Record your monitoring information in the "Bay Grasses in Classes: Data Log".

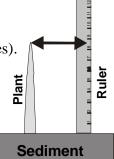
- 1. Daily Monitoring (record the following information)
- Water temperature (in degrees Fahrenheit)
- Water level in the growth chamber. Fill to 16 ½ cm daily (or 6½ inches).
- Height of the light above the water surface. Should be 25 ½ cm (or 10 inches).
- Any additional observations or comments.

2. Weekly Monitoring

Wild Celery:

Week 1 = the first week that germination is noticed

- Water chemistry (pH, Nitrate). See instructions in box.
- Plant height above sediment (measured in cm, NOT inches).
 - o Tallest plant in each tray and the average within each growth chamber.
- Any additional observations or comments.







Redhead Grass, Sago Pondweed, Water Stargrass:

- You will measure plant height and observe the number of leaves in tray one of both growth chambers (Figure 8). You will continue to send data from tray one until a majority of the plants have eights leaves (nodes). At this point, you will be ready to do your second micro-propagation.
- When you have divided your plants for the second time, you will only send data from tray two in each growth chamber. You will continue this until a majority of the plants in the tray have eight leaves, and you will micro-propagate for the third time. During each micro-propagation, make sure to clip the plants in the parent tray. After the third planting, all data sent will be from tray three.
- At this point, all of your trays will have plants in them. They will be roughly the same size. Continue to send data on tray three until planting day or MD-DNR contacts you and instructs you to stop recording.

3. Submitting your data

• Each week, go to the DNR on-line data entry page of the website at http://mddnr.chesapeakebay.net/bgic/loginindex.cfm to enter data for each growth chamber. If you do not have internet access, fax the completed Bay Grasses in Classes Data Log to Maryland DNR at 410-260-8859. Remember to send one sheet for each chamber each week. Your bay grass data will be compiled with data from all other participating schools and placed on the Bay Grasses in Classes website. You will be able to compare the growth of your plants with all the other participating schools by going to http://mddnr.chesapeakebay.net/rastea/bgicsql/data.cfm

Teachers Note: It is OK to ignore the plants for up to a week at a time PROVIDED THE WATER LEVEL IS ADEQUATE. If the water level drops below the powerhead intake, it will break, and an electrical shock could result. A water level drop of about 5 cm per week is normal, but this could vary significantly from school to school. Be sure that growth chambers are filled before leaving for spring break or long weekends





Preparing for Planting Your Bay Grass

Maryland DNR and CBF will identify a nearby site for bay grasses restoration. When your plants reach adult size (about 60 days) you will be able to assist scientists in planting your bay grasses at this restoration location. Your plants, along with those of the other participating schools, will increase the size of the new bay grass bed and will increase both its ecological value and its chance of survival.

To prepare your bay grass for transport to the planting site:

- 1. On the bay grass planting day, remove most of the water from the bay grass growth chamber by siphoning or dipping, until the water level just barely covers the top of the planting trays. This will reduce the weight, making the chambers easier to transport.
- 2. In order to reduce the drying of plants during transport, cover the growth chamber with several sheets of wet newspaper. These should be placed directly on the surface of the plants.
- 3. When you arrive at the planting location, be sure to put your grasses in an area out of direct sunlight and add water to the chambers if possible.
- 4. Make sure that you label the 2 growth chambers with your school's name and teacher's name, since there will be many other schools planting the same day.

Teacher's Note: Funding assistance for transportation to Bay Grasses in Classes planting locations will be provided by the Chesapeake Bay Trust. Please complete the attached application form and return to the Chesapeake Bay Trust ASAP to provide time for processing. If you do not submit the form before the due date, costs will not be covered.









2009 Wild Celery Data Log

School:	Teacher:									
Grade/Class:			Week# 1 2 3 4 5 6 7 8 9 10 11 12 13 14 (week 1 = when germination is first noticed)							
Experiment Type	: (Circle one) Lig	ht Time,	Flow Rate,	Sediment '	Гуре, Temper	ature, O	Other			
Chamber Type:_	e:(for example, # of hours of light, flow, no flow, salinity tank)									
			D_{ϵ}	aily Moni	toring					
Date (month/day)	Water Temp (°F)		Water Depth fill to 16 ½ cm)		Light Height (should be 25 ½ cm)		Comments (Date plants first visible, heavy algal growth)			
Monday										
Tuesday										
Wednesday										
Thursday										
Friday										
			V	Veekly Mo	onitoring					
	Date		Averag Temperat		pН		Nitrate (ppm)			
					centimeters)		<u>'</u>			
Growth Chambe		licate ch)	T. 2		T. 4	1		
Date	Tray 1		Tray 2		Tray 3		Tray 4	Average		





^{*}If you are doing a within tank experiment, please do not average the plant height data.





2009 Redhead Grass Data Log

School:					Teac	her:				
Grade/Class:				Week #				(Week 1 = first micro-propagation)		
Chamber Type: (circle one)				Chamber A Chamber B 75°F/24°C 84° F/29° C		Cham 92°F/				
Current week_				Week of latest Micropropagation						
Number of Mic (Black ink only			ns _	When was tank treated with algicide						
				Daily	y Cha	mber Monito	oring			
Date (month/day)	W (°F)	ater Temp (°C)	Water Depth (fill to 17 cm or 6 1/2")		Light Height (should be 26 cm or 10")		Comments (heavy algal growth, cloudy water)		
Monday 										
Tuesday										
Wednesday										
Thursday										
Friday 										
Average Temp:										
	,		•		Week	ly Monitoring	7			
Date						рН		Nitrate		
Tallest plant in tray (cm) (cn		lant i cm)			est plant in tray (cm)	Talle	st plant in tray (cm)	Average Plant Height (cm)		
Number of leaves Number		r of l	eaves Number of leaves		mber of leaves	Nun	Number of leaves Average number leaves			









2009 Sago Pondweed Data Log

School:			Teac	cher:						
Grade/Class: _				Wee	ek#	(Week 1 :	(Week 1 = first micro-propagation)			
Chamber Type	ccle one)	Chamb 75°F/2		Chamber B 84° F/29° C		Chaml 92°F/				
Current week_			We	ek of lat	test Microprop	·				
Number of Mic (Black ink only		S	When was tank treated with algicide							
			Dat	ily Cha	mber Monite	oring				
Date Water Temp (°F) (°C)		(fill to	r Depth 17 cm or 1/2")	Light Height (should be 26 cm or 10")		Comments (heavy algal growth, cloudy water)				
Monday ————										
Tuesday										
Wednesday										
Thursday										
Friday ————										
Average Temp:										
				Week	ly Monitoring	<u> </u>				
Γ				pН			Nitrate			
Tallest plant in tray (cm) (cm			Talle	est plant in tray (cm)	Talle	st plant in tray (cm)	Average Plant Height (cm)			
Number of leaves Number of		of leaves	Nu	mber of leaves	Nun	nber of leaves	Average number of leaves			









2009 Water Stargrass Data Log

School:			Teac	cher:				
Grade/Class: _			Wee	ek#		(Week 1 = first micro-propagation		
Chamber Type	e: (cir	cle one)	Chambe 75°F/24	mber A Chamber B 5/24°C 84° F/29° C			Chamber B 92°F/33°C	
Current week_		Weel	k of lat	est Micropropa	l			
Number of Mic (Black ink only								
			Daily	y Cha	mber Monito	oring		
Date Water Temp (°F) (°C)		Water Depth (fill to 17 cm or 6 1/2")		Light Height (should be 26 cm or 10")		Comments (heavy algal growth, cloudy water)		
Monday								
Tuesday								
Wednesday								
Thursday								
Friday ————								
Average Temp:								
			,	Week	ly Monitoring	5	1	
Date			pН					Nitrate
Tallest plant in tray (cm) Tallest plan (cm			•		est plant in tray (cm)	Talle	st plant in tray (cm)	Average Plant Height (cm)
Number of leaves Number		Number (of leaves Nu		mber of leaves Nu		nber of leaves	Average number of leaves









Consent/ Release Form

As parent or legal guardian of	, I certify							
that said child has my permission to attend and participate	, ,							
Program sponsored by the Maryland Department of Natur								
acknowledge that my child will be participating in the following								
canoeing, seining, nature hikes, and planting grasses in C								
hereby grant the Maryland Department of Natural Resources the unconditional right to use the								
name, voice, and photographic likeness of								
connection with any of their audio video production, artic	les or press releases but not as an							
endorsement.	les, or press releases, but not as an							
	Landa di santa di san							
I, Emergency Medical Care to be provided for my child,	_, nereby give my consent for							
Emergency Medical Care to be provided for my child,	, while he/she							
is participating in the "Bay Grasses in Classes" program.								
Physician:Phone Number:()	<u> </u>							
Phone Number:()								
Allergies:								
Allergies: In case of an emergency during program hours, I can be re	eached at:							
Signature of parent or legal guardian Da	inte							
RELEASE STATEMENT:								
I acknowledge that there are natural hazards with activitie	es in an outdoor setting. I hereby affirm							
that my child is in good health and physically capable to p	erform the required activities of the							
program. In consideration of the Maryland Department o	f Natural Resources Bay Grasses in							
Classes Program accepting my child and to the extent per								
hereby release and forever discharge the State of Marylan	11							
all claims of liability for any damages or injuries which ma								
to the extent permitted by state law.	y be sustained withe my clind is at eamp							
to the extent permitted by state law.								
Parent/Guardian Signature	Date							
2 de la compania del compania del compania de la compania del compania de la compania del compania de la compania de la compania de la compania de la compania del compania								

Maryland Department of Natural Resources Tidewater Ecosystem Assessment Tawes State Office Building 580 Taylor Avenue D-2 Annapolis, MD 21401











Maryland Department of Natural Resources Resource Assessment Service Volunteer Information & Registration

This registration form between the MD Department of Natural Resources and each volunteer is subject to the following terms and conditions:

- 1. **Registration.** ALL volunteers must register on forms provided prior to doing any work. Registration qualifies the volunteers for State liability and medical protection.
- 2. **Duties.** No volunteer should undertake any work or use any equipment for which he/she is not trained and qualified. Volunteers are **not** permitted to drive a State Vehicle. Volunteers must use the same safety equipment required of the Department of Natural Resources personnel conducting similar activities. Volunteers who operate their own power equipment do so at their own risk.
- 3. **Liability.** Volunteers, like other State employees, are immune from tort liability if they are acting within the scope of their assigned public duties and without malice or gross negligence even if the damages exceed the limits of the State=s waiver of immunity. Volunteers sued for alleged negligence are eligible for State legal assistance provided the limitations are not violated. The Department of Natural Resources relinquishes any claim for loss or damage to State property which results from supervised activities in State facilities, provided those activities are conducted without malice or gross negligence.
- 4. **Medical Coverage.** The State Treasurers Office provides volunteers with accident/medical insurance in the amount of \$2,500 for personal injuries and accidental death/dismemberment insurance in the amount of \$10,000. Proof of claim forms must be submitted to the Department of Natural Resources within thirty (30) days of the date of the accident.

5. Coordination. The volunteer program will questions or concerns should be addressed to him at5/4/09 to6/5/09	410-260-8634. This form covers the period of
Volunteer Name: Address:	
Telephone:	
I acknowledge that I have read and understood the about statement I am considered a DNR volunteer.	ove information and understand that by signing this
Signature	Date:







